

Nuclear Reactor Instrumentation and Control (I&C) and Digital I&C Implementation

Executive Summary

The objective of this project is to develop comprehensive undergraduate and graduate courses that will include reactor control, instrumentation, digital I&C, discussion on licensing issues, and case studies of digital implementation in current commercial reactors and the University of Florida Training Reactor (UFTR). These courses will address the following subject areas: reactor system design, reactor kinetics/dynamics, control strategies, fundamentals of linear system control theory, design of classical controllers, introduction to modern control systems, digital devices such as the field programmable gate arrays (FPGA) and others, examples of applications of digital I&C in operating reactors, development of I&C systems for the UFTR, and regulatory issues related to digital I&C.

The implementation of digital I&C systems is being considered by nuclear utilities for system upgrades of current reactors, and for the next generation of nuclear reactors. Hence, there is an urgent need to train the next generation nuclear engineers and I&C personnel in the areas of instrumentation, controls, and digital systems. The deliverables of this project will include a comprehensive text of the course materials with examples and worksheets, PowerPoint slides for class lectures, and examples of applications to the UFTR.

To ensure that the curriculum development includes the most up-to-date and relevant NRC and industry methods and guidance in the area of instrumentation and control, collaboration with a senior member of the NRC regulatory staff in the development of the material will be sought.

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